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EDITORIAL NOTES

FUEL RATIONING

LAST Thursday the House of Commons debated at length the proposed fuel rationing scheme, with particular reference, of course, to the Beveridge report (last week's "JOURNAL," pp. 203, 206). The debate showed that the need for fuel rationing was generally accepted, but there was a volume of criticism of the Beveridge scheme and the lack of foresight shown by the Government in regard to coal output. Opinion was general that economy in the domestic use of coal is unavoidable and that economy implies rationing. Division of opinion was on the method of rationing. It was promised that a White Paper explaining the broad principles of the rationing plan decided upon would be issued, and that if the House desired further debate the Government would provide for it. The desire quickly was made manifest, and there is to be another debate before final decision is taken, but the Government made it clear that rationing is essential and should begin, as originally intended, on June 1.

Parts of the debate and some of the statements made and opinions expressed subsequently in the daily Press have caused us some surprise. In the House Mr. Greenwood said that since last March there had been a deliberate campaign by vested interests—he referred specifically to the gas and electricity industries—with a "view to protecting selfish interests." As recorded in the "JOURNAL" last week, the suppliers, while they emphasized the difficulties of any scheme as a ground for preferring the alternative of increased production, emphasized also "their readiness to co-operate wholeheartedly in the scheme should rationing be decided on by the Government. . . . The main principles of the scheme . . . were recognized . . . though in the case of gas and electricity with some division of opinion, as the right principles to be embodied in any scheme of rationing that might be found necessary." We think there are no grounds for suggesting that either the Gas Industry or the electricity industry has been animated by selfish interests, and we cannot think they have "engineered" Press campaigns against the Beveridge scheme or the general principle of rationing. On March 7 *The Times* stated in a leading article that "the objection to a 'points' rationing scheme comes principally from the gas and electricity undertakings, which have, however, put forward no alternative." We are aware (*vide* last week's "JOURNAL") that some in the Gas Industry favour the basic past-consumption assessment on the grounds of simplicity, while others, in common with ourselves, favour the points system on the grounds of equity. But the Gas Industry has not expressed itself, as an Industry, as being opposed to the points system as advocated in the Beveridge report. It is true that no alternative scheme has been proposed by the Industry; throughout, we have been assured, the Industry's aim has been to co-operate with the Government and there has been neither thought nor place for selfish interests.

In the House Sir Arnold Gridley brought forward as an alternative to the Beveridge scheme the independent rationing of fuels by suppliers. He urged that gas undertakings should be authorized to announce to consumers that they would have to reduce their consumption to, say, 80% of that of the corresponding quarter of the previous year. They would be charged on this allotment at ordinary existing prices, and if there was excess consumption there would be a penal price for this excess —a price such as 15s. a therm. He would exclude consumers of gas whose consumption was less than 100 therms per annum where gas was used for cooking, which would wipe out about 50% of the consumers who would otherwise have to be assessed. His argument was that his plan would also wipe out all the prepayment consumers in the country and it would wipe out coupons. To our mind, however, such a scheme would be most inequitable, and the tendency towards mal-distribution of demand would not be stemmed. There can be no justification in equity for it. The fact remains that large sections of the community could help to "corner" the market in gas *via* the prepayment meter and heighten distribution disparity, which it is one of the chief functions of rationing to dispel. And we accept the statement of the President of the Board of Trade that the whole purpose of any rationing scheme is to secure a distribution based on need, as contrasted with a distribution according to wealth or scramble or luck. Last winter, he explained in the House, in spite of improvements in transport and the absence of enemy action, large sections of the people experienced temporary coal famine; in many places stocks were almost exhausted. There were, he added, many gas undertakings with their stocks almost exhausted. Of the gas undertakings in the country 42% held at the end of the winter less than four weeks' stocks; and he had been informed that without six or seven weeks' stocks at the beginning of next winter they could not accept the responsibility of maintaining gas service. Rationing of fuel must obviously be an irritating and a complicated procedure, but a few complications appear to us to be preferable to a scheme, maybe simpler, whereby the ration is based on previous consumption or where, to avoid trouble, there is over a 50% loophole. In 1937 the number of prepayment consumers was 7,007,204; the number of ordinary consumers was 4,002,541. Prepayment consumers to total consumers were in the ratio of 7 : 11, and not by any means 5 : 10. Since 1937 (the figures we quoted are from the Board of Trade Return) there was, pre-war, an increase of the prepayment-ordinary ratio, a substantial increase. We believe that the long purse as it affects gas consumption and the rightful distribution of coal is very largely to-day in the hands of prepayment gas consumers, and that to exempt them from a scheme of rationing of fuel would be a sign of weakness on the part of the Government and a sign of weakness on the part of the Gas Industry if it acquiesced in it merely to save trouble and inconvenience. The Gas Industry surely is the servant of the public and not of any one section of it, and it could hardly accept such a seemingly facile solution as that offered by Sir Arnold Gridley.

The while the subject of fuel rationing remains in the air, with, we are informed, the tone of opposition hardening. We should, of course, like to know what the Industry—as an Industry—constructively thinks about this matter.

HEATING AND HEALTH

REFERRING at the end of last year to the series of twelve Papers on the post-war home which had been arranged by the Royal Society of Arts we said how desirable it was that the Gas Industry should follow these contributions, and pointed out how necessary it was that co-operation and understanding between the Industry and the architect should be strengthened, for the Industry has obviously a great stake in home building and a collateral responsibility. Homes should have their equipment for cooking, heating, and hot water pre-planned rather than have this equipment wastefully and often clumsily installed as an afterthought. Such equipment should be regarded as an essential and integral part of home design, and it cannot fall into this pattern without the co-operation of which we have spoken, which is part of a wider co-operation between all concerned in providing healthy, convenient, and comfortable homes.

Current studies of the Building Research Station of the

D.S.I.R. are very wisely being concentrated on the home, and more particularly on the home of the wage-earner. The tenth Paper of the Royal Society of Arts series was by Mr. R. Fitz-Maurice, the Principal Scientific Officer of the Station, and it was concerned with this work. Low-cost housing does, of course, present difficult problems; every penny on the cost of building has to be thought about and well spent. The fact remains that by inefficient appliances and inferior construction the householder may be forced to incur appreciable extra running cost to maintain himself in a state of comfort which he could easily obtain at a lower cost in a better built and better equipped house. The task, which the Gas Industry can help to solve, is to make a careful balance between initial cost and running cost and to plan so that the householder gets the best value for his money. Post-war housing has to be thought about in terms of maximum economy in first cost, in running cost, and in labour.

For the most part the Paper by Mr. FitzMaurice dealt with the matter broadly, but, though the discussion was very discreet, it did point to the part which the Gas Industry should play in this co-operative development we have in mind and which we are sure is the only way towards satisfactory progress. The Author discussed heating and ventilating under one heading, which we regard as the right approach. The two are intimately related. A system of heating devised without taking into account ventilation will fail to give comfortable conditions, and *vice versa*. The heating of a house is as vital to the well-being of the occupants as any other single feature, and the truth is that the English home is not well heated. There are two important aspects of the heating problem—economy in the use of fuel from the point of view of the conservation and proper use of one of the most vital national assets, and economy in the use of fuel from the point of view of providing the individual with the maximum amount of warmth in his home at a price which he can afford to pay. And we were glad that the Author emphasized that from the standpoint of the conservation of our fuel resources, economical methods of heating must go hand in hand with more scientific use of coal. Coal should be treated to obtain by-products and produce smokeless fuels. It is possible to look forward confidently to completely smokeless heating of the home, even if the open fire is to be retained. The question of what is to be done about it is at the moment under the active investigation of a group of workers of the D.S.I.R., and we naturally look forward to their conclusions. It is certain that among improvements which can be looked for are better housing construction to ensure that heat wasted by conduction through the building fabric is reduced to a minimum and the development of more efficient heating appliances, coupled with the rousing of public interest in them.

The closest touch should be kept by the Gas Industry with this domestic heating investigation at the Building Research Station, and the workers engaged should be made fully aware of the findings already arrived at by research in the Industry, so that conclusions will not be drawn without full knowledge and understanding of this research. This matter ought to be and it probably is the intimate concern of the Domestic Heating Committee of The Institution of Gas Engineers, which has been particularly concerned with a review of the present and possible future development of district heating and has under consideration—*vide* Communication No. 242 of the Institution—matters concerning domestic heating and ventilation in relation to post-war planning.

So that, before terminating this note on the Paper by Mr. FitzMaurice we would mention the comments made on the subject of district heating, which is a topical aspect much exercising the minds of planners, many of whom are attracted by the possibilities of heating a whole district from a single boiler house or by a single heat supply. This form of heating has been practised for some time in several other countries and a good deal has been written in its praise. The subject is under investigation here, but the applicability of the system to British conditions is uncertain. The idea, especially to the layman, is no doubt attractive, but the variable nature of the British climate definitely imposes an obstacle. We have discussed the matter recently, suggesting that it was difficult to say what place gas and coke could naturally occupy in this direction. We think that the direct application of town gas is remote, but that there is a very large field before coke for what may be termed localized district heating schemes. Mr. FitzMaurice hinted that "interesting proposals" are on foot which may lead to the development of district heating on a practical scale, but he did not omit mention of the important consideration that an installation capable of handling the heating load during the relatively limited cold weather experienced normally in this country will not be running nearly to its capacity over the greater part of the heating season. Small scale projects may be far more justifiable than large schemes which may look well on paper.

Location of Industry

In the debate in the Commons following the moving of the second reading of the Minister of Works and Planning Bill Sir W. Jowitt said that national considerations concerning the location of industry might involve a clash between national and local interests. There are now in the country up-to-date factories which might well be the nucleus round which new communities might form. It might mean we should not desire to rebuild factories which had been knocked down. It might be that further extension of factories in London was undesirable—that we had too much of the population in the south. If we were to have rational planning we must have some body which could give a directive to the local authority, who must plan its locality in the light of that direction, based on national considerations.

"Austerity" Canteen Equipment

A schedule of "austerity" cooking appliances for use by Government Departments ordering kitchen equipment for new British Restaurants and canteens for schools, pitheads, and factory workers has been published for the Ministry of Works and Buildings by H.M. Stationery Office, price 1s. Economic design is a feature of the ovens, ranges, boilers, &c., described in the schedule, ornamental types being rigidly excluded. The use of all materials in short supply, and particularly non-ferrous metal, has been reduced to a minimum. Where practicable, metal feet, legs, or stands will be replaced by brick or concrete piers, and air-drying black paint is used in preference to enamel or other elaborate external finishes. Each item in the schedule has been made as light as is consistent with its purpose and durability. Simplification of design and the reduction in the number of types and size ensure rapid production by a number of manufacturers with a minimum of labour, thus reducing war damage risks, transport, and other wartime difficulties. Progress is not restricted, however, for improvements may be made by manufacturers within the limits of the specifications contained in the schedule. All the appliances and materials must be in accordance with British Standard Specifications and Home Office Regulations. The schedule replaces that issued last September, and considerably reduces the number of designs, types, and sizes then approved. It was produced with the co-operation of manufacturers and all interested Government Departments, and includes all the equipment necessary for canteen kitchens in wartime. Appendices covering kitchen machinery and fittings, tea-making appliances, and portable equipment will be published shortly.

Limitation of Supplies

Manufacturers and wholesalers of gas space-heating appliances for domestic purposes must restrict their supplies of these appliances during June and July to one-twelfth, by value, of the corresponding supplies during the period from June 1 to Nov. 30, 1939. Such is the effect of a Limitation of Supplies Order issued by the Board of Trade, under which all manufacturers and wholesalers are required to apply for registration not later than May 23. The Board will decide whether the name of the applicant (manufacturer or wholesaler) shall be entered on the Register or not, but an unregistered manufacturer—*i.e.*, one whose name is not entered on the Register—will be obliged to restrict his supplies, through all channels, of controlled goods of his own manufacture to £100 per month. Registered persons will be required to restrict their supplies in June and July, other than through certain specified channels, to one-twelfth of the corresponding supplies in the standard period, and it is anticipated that further orders will be issued for subsequent periods which will have the effect of limiting total supplies to about one-quarter of those of the pre-war datum period. Supplies to other persons registered

for the same class, for Government contracts, for direct export, and to the British Red Cross Society, local authorities, and kindred bodies, are excluded from the limitation.

Institution of Gas Engineers

The 79th Annual General Meeting of the Institution will be held in London, subject to conditions then obtaining, on Wednesday, June 10, under the Presidency of Sir Frederick J. West, C.B.E., J.P. In view of the shortage of accommodation in London at the present time, members are strongly advised to make immediately their hotel reservations for the meeting.

Personal

On April 18, at St. Barnabas' Church, Middlesbrough, the marriage took place of Captain A. D. DUXBURY, R.E., and Joan Hall, M.B., Ch.B. Captain Duxbury is the son of Mr. R. H. DUXBURY, Director, Engineer, and Secretary of the South Bank and Normanby Gas Company. He was serving, under Mr. C. S. Shapley, with the Leeds Corporation Gas Department, when he joined H.M. Forces on the outbreak of war.

Obituary

As we go to press we learn with great regret of the sudden death on May 8 of Mr. B. B. WALLER, of Messrs. George Waller & Son, Ltd.

* * *

Many friends in the Gas Industry will be sorry to learn of the death on May 8 of LADY BENCRAFT, wife of Sir Russell Bencraft, Chairman of the Southampton Gaslight and Coke Company.

Letter to the Editor

Fuel Planning

DEAR SIR,—We note that Dr. E. W. Smith has invited constructive proposals concerning the essential changes required in the Gas Industry. As a branch organization, with a membership approaching the 600 mark, representative of the professional, clerical, and administrative staffs of the Industry, our very being arises from the mistakes of local rationalization, past and present, and in consequence we hope our views developing from current discussion will be worthy of his attention.

We recognize that rationalization is inevitable if the Industry is to have a future, but we are most apprehensive as to what form it will take. As we see it, rationalization will achieve its object if—

1. *From the national point of view.*
   Each kind of fuel is allocated its appropriate sphere.
2. *From the consumer's point of view.*
   There is a maximum of service at minimum cost.
3. *From the staff point of view.*
   It is recognized that the honest fulfilment of these obligations can only be obtained through the staff being properly represented and adequately remunerated.

Hitherto indifferent attention to these three essentials has resulted in a fuel service (in the fullest sense of the term) being sacrificed in an endeavour to obtain a higher yield per "unit" employed. In short, gas and other fuels have been regarded too long as commodities and not as services essential to the community.

90, Stanford Road,
S.W. 16.
May 6, 1942.

Yours faithfully,
D. A. LIARDET,
Branch Secretary,
National Union of General and Municipal Workers.

The Next Meeting of the Fuel Luncheon Club will take place at the Connaught Rooms, W.C. 2, on Friday, May 15, at 12.40 for 1.10 p.m., when the after-luncheon Address on "Wartime Problems of Industrial Coal Supplies with Special Reference to Complaints" will be given by Mr. Alan S. Bean, of Messrs. United Analysts, Ltd., Sunderland.

The Next Meeting of the Eastern District of the Southern Association of Gas Engineers and Managers will be held at Gas Industry House, Room No. 1, at 2.30 p.m. on Friday, May 22, when Mr. E. G. Stewart, Engineer of the Fulham Works of the Gas Light and Coke Company, will open a discussion on "The Implications of a Reduction of Calorific Value under Wartime Conditions."

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

North of England Association

At the Annual Meeting of the North of England Gas Managers' Association held in Newcastle on May 1, the following were elected as Officials for the ensuing year:

President—W. Tunmore, Bishop Auckland.
Vice-President—J. W. Pallister, Middlesbrough.
Committee—J. G. Aitkin, Carlisle; E. Crowther, Newcastle; F. P. Fall, Sunderland.
Hon. Secretary and Treasurer—H. D. Lees, Hexham.
Hon. Auditor—C. C. Walmsley, Sunderland.
District Education Committee—E. Crowther, R. H. Duxbury, J. M. A. Mitchell, A. E. Ruffhead.

S.B.G.I. Medals

The Council of the Society of British Gas Industries have again this year awarded Silver Medals to each of the Junior Gas Associations for the best Paper adjudged to have been presented during the year by their members at a general meeting.

Fifteen papers were submitted by five Associations for adjudication. They were of a high standard and the following awards were made:

Manchester and District to J. B. Walsh for Paper, "Co-ordination of Low and High Pressure Supplies."

Scottish—Eastern District to W. Masterton for Paper, "An Improved Recording Gas Calorimeter."

Scottish—Western District to John Fleming for Paper, "Drawing Office Routine."

Yorkshire to D. C. Gunn for Paper, "Gas and the Internal Combustion Engine."

London and Southern District to T. S. Ricketts for Paper, "Gas and Steam Loads on Small Gas-Works."

The Institution of Gas Engineers

The Council of The Institution of Gas Engineers met, by invitation of the President, in Manchester on May 5, 1942. There was a very good attendance and the following were some of the matters dealt with:

The death was reported since the last meeting of two members of the Institution, Mr. J. M. Campbell (Margate), a former member of the Council, and Mr. James Taylor (Weston-super-Mare), a member of the Committee of Management of the Benevolent Fund.

The final details of the programme of the 79th Annual General Meeting to be held, subject to conditions permitting, on June 10, were settled, including the arrangements for the presentation and discussion of the following short Papers:

(1) Policy and Scope of the Gas Research Board, E. V. Evans, O.B.E.
(2) The Gas Industry in Relation to Post-War Domestic Architecture, E. Crowther.
(3) Scientific Control in the Retort House and its Contribution to National Fuel Economy, T. Campbell Finlayson.
(4) The Design and Operation of Gas-fired Industrial Furnaces in Relation to National Fuel Economy, E. A. C. Chamberlain.
(5) The Contribution of the Gas Industry in the Domestic Field to National Fuel Economy, H. Hartley.
(6) University Training and the Gas Industry, Professor D. T. A. Townend.

The 79th Annual Report of the Council and the Accounts were approved for submission to members of the Institution.

Consideration was given to the nomination to be made by the Council for election by ballot of the Corporate Members of four Ordinary Members of the Council for 1942–45.

The Annual Report of the Committee of Management of the Benevolent Fund, which will shortly be sent to all contributors, was received and considered.

Reports were made by District Members of the Council concerning activities in their Districts. This special item of the Agenda has already proved its usefulness.

A report was made of the meeting of the Gas Education Committee, including the announcements that the Ministry of Labour and National Service were considering a scheme for the training of disabled ex-service men in gas fitting, and the arrangements being made through the Prisoners of War Department of the British Red Cross Society to assist candidates, being prisoners of war, to continue their studies for the Examinations of the Institution and, if necessary, to arrange for their examination.

The Institution of Gas Engineers has been asked by the Director-General of Works and Buildings (Ministry of Works and Buildings) to undertake the responsibility for a committee dealing with gas installations in buildings. The Council appointed the Committee, which will be meeting in the near future.

A report was made of the current activities of the Parliamentary and Scientific Committee.

Meetings of the London and Counties Coke Association will be held at Gas Industry House on May 18 as follows: Finance Committee, 10.30 a.m.; Executive Committee, 11.15 a.m.; Central Committee, 1.30 p.m.

INSTITUTION GAS FELLOWSHIP REPORTS

Authors' reply to the Discussion (see "JOURNAL" of April 8, p. 61) on Communications Nos. 244 and 245 of The Institution of Gas Engineers

WE are grateful to Mr. Densham and to Mr. Minchin for their thoughtful contributions to this Discussion, and we would also thank Mr. Pearson for his interesting note on the practical utilization of the phenomena of limiting diameters; particularly so because, as will be generally appreciated, the writing and discussion of Papers is a difficult matter these days. It is important nevertheless that specialists in the Gas Industry should be thinking over their problems so that when the time of reconstruction comes they may be the better equipped to consider what developments may then be demanded. In this spirit we tabled the rather new approach to the problems of aerated burners indicated by our results, appreciating that the knowledge we had gained—over a period when it was still possible to pursue experimental enquiry—is imperfect and that much remains to be explored. We feel that the pooling of information and ideas directly it is available is much more in the common interest than deferring publication until interpretation is final and concrete. Moreover, the study of aerated burner flames is so complex that there is a long way to go before anything like a complete understanding of all the phenomena concerned will be forthcoming.

The Measurement of Ignition Velocities.

In reference to Mr. Densham's opening paragraph, we feel we should state that if the only outcome of our work is to provide figures lying "within the scatter of values obtained by earlier experiments," then this in itself would not be "satisfactory" as he suggests, but most unsatisfactory. The value of what has been achieved, if substantiated when the work is extended more fully, is that a method is provided of determining an ignition velocity as a physical constant, independent of all experimental variables. Once effected, this would dispel much of the fog with which the subject has been enveloped by those who have relied for their evidence on experimental "short cuts."

To the student of flame phenomena the clarification of this issue would provide one of the greatest advances in the subject for half a century; and to those concerned with the practical problems of aerated burners, we would merely repeat an observation made in a contribution to the Discussion of the recent Paper by Fuidge, Murch, and Pleasance* that "the number of variables which call for consideration in the study of bunsen flames is such that any investigation which has as its aim the separate examination of any of them must be regarded as likely to provide a valuable contribution to the subject as a whole."

Distribution of Velocities at the Burner Head.

We agree that the feed velocity distribution at the inner cone flame surface is not precisely parabolic, whatever it may be inside the burner; the evidence of fig. 21 (1939–40 Report) seems to indicate this, and to show that while the gas velocity above the centre of the burner is much greater than immediately above the wall, the difference is not as large as might be expected were a parabolic distribution to hold. This fact does not affect the case which we have put forward regarding the relationship between "light-back" and "dead space," for on decreasing the rate of flow, it is in a part of the gas-stream near the burner wall where the mixture speed first becomes equal to the ignition velocity.

As far as experimental evidence of velocity distribution is concerned, we doubt whether Mr. Minchin's interpretation of the results of Andrade and Tsien that "a square-headed distribution of velocity is far more common" is correct; these authors did not claim this—they were in fact guarded in their statement as to how far their observations might be applied generally. The best information, as far as burners are concerned, would be that recently published by the U.S.A. Bureau of Mines,† from which the following is a quotation: "Preliminary photographs of a gas stream issuing from the orifice with streamline flow show parabolic distribution of velocity across the stream, as is found in fluids travelling in pipes. As the stream travels upward, momentum transferred from the faster moving central layers and friction at the side of the boundary flatten the velocity distribution. The layers near the boundary seem first to receive energy from the central layers, increasing their velocity only to decrease again owing to friction at the boundary."

The Nature of Light-Back.

The observation made by Mr. Minchin as to the mechanism by which a flame recedes into a burner is very interesting. While we cannot recall having seen exactly what he describes ("the toe of a sock being pulled inside out"), we think the truth of the matter is that just how any particular flame behaves depends on mixture composition and working pressure; but the controlling influence in any particular case seems to be the "dead space," and whatever may happen to the apex of the inner cone, the locus of "light-back" approximates to the "dead space" distance from the wall. Fig. A shows two series, each of five instantaneous shadow photographs, showing various stages during "light-back" with two ethylene-air mixtures (No. 1 near theoretical composition; No. 2 nearer the limit of inflammability); from these it will be quite clear that the apex of the cone retains its shape right up to the moment when it disappears within the burner. Usually, as is seen in Series 2 before the flame descends into the tube, it recedes first on one side of the stream and not uniformly round the periphery. This has the effect of throwing the apex of the cone towards the side of the burner; this may, in fact, be the phenomenon Mr. Minchin describes.

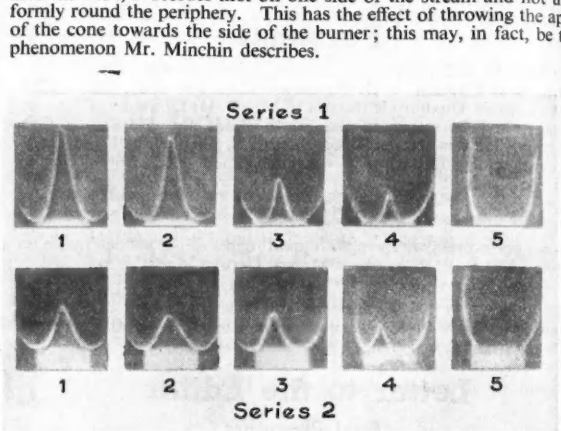

FIG. A.

On the other hand if, under our conditions of experiment, a mixture is either (*a*) close to the limit of inflammability or (*b*) at reduced pressures, in both of which circumstances the "dead spaces" are large, then frequently a flame may appear hollow just before descending the tube. Some of the effects observed are illustrated in Fig. B. The illustrations at the top of the diagram (right to left) show the influence on the shape of the cone of decreasing feed velocity at a pressure of 50 cm. mercury. Were the feed velocity reduced any further, the cone shown at the top left-hand corner would recede into the tube, the flame travelling unsymmetrically downwards, but with the apex of the cone retained (*cf.* Series 2, fig. A). If, however, at the same rate of feed the working pressure is reduced, then the flame will be rendered more

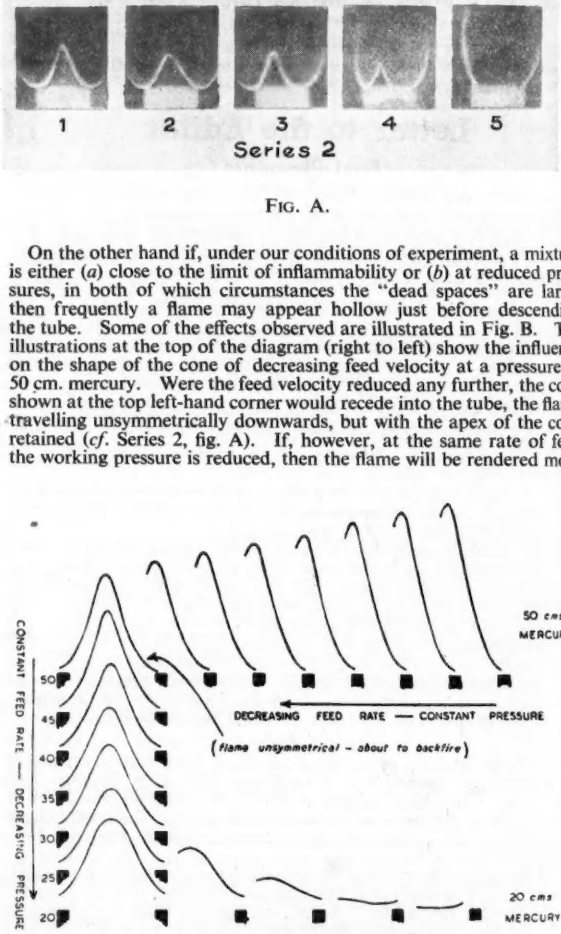

FIG. B.

stable because the "dead space" is progressively increased. Finally, if at a pressure of, say, 20 cm. mercury the feed velocity is reduced, then the flame will eventially light-back, its shape following the sequence of events illustrated (left to right) at the foot of the illustration. Under these conditions the apex of the cone flattens.

We know, therefore, that there is no rule as to how the apex of the cone will behave; "light-back," however, always first occurs near the burner wall, and the behaviour of the cone generally will depend upon the "dead-space."

* *Trans. Inst. Gas Eng.*, 1939-40, **89**, 326.
† *Annual Report of Research and Technologic Work on Coal*, 1941.

Limiting Diameters.

(*a*) Turning to the limiting diameters dealt with in the Interim Report, our main purpose was to indicate their dependence on the chemical composition of any supply, irrespective of variations in calorific value. This was brought out clearly in fig. 3, dealing with simple gases, and in fig. 5, dealing with industrial supplies. It is true, as Mr. Minchin points out, that the influence of ethylene addition to the town gas employed (fig. 7) might well have been explained on the basis of change in calorific value, a point to which we ourselves referred. Had we studied the influence of, say, methane addition, however, instead of ethylene addition, we doubt whether a calorific value interpretation could have been invoked. Fig. 5 demonstrates that, with different industrial supplies, limiting diameter bears no relation whatever to calorific value; and even if one restricted consideration of the matter to town gases, it may be pointed out (i) that whereas the calorific values of the two town gases studied were 470 and 500 B.Th.U. respectively, the air requirements for the complete combustion of the two supplies were identical; moreover, (ii) while calorific values of town gas B (504) and town gas A containing 1.3% benzole (506) were almost identical, the variation in limiting diameter was marked, as the following figures show:

Gas in air, per cent.	Limiting Diameters, mm. Town gas B.	Town gas A containing 1.3 per cent. benzole.
15	2.26	2.46
20	1.78	2.03
25	2.26	2.69
30	5.61	7.54

(*b*) Mr. Minchin is wrong in his statement that "dead space" can only be an effective criterion of "light-back" tendency at air-gas ratios near the theoretical. With all mixtures so far examined, whether using ethylene or carbon monoxide, a straight-line relationship has been found between the "light-back" values and the reciprocal of "dead space" at varying pressures. From the measurement of limiting diameters one is provided with an index of the relative tendencies to "light-back" of different supplies at the same air-gas ratio; for complete immunity from "light-back," however, one would, of course, have to use the minimum limiting diameter, which approximates to that observed with the theoretical mixture. From the foregoing it is obvious also that neither is the criterion restricted in its application to flame-proof burner heads.

In regard to Mr. Minchin's remarks concerning heating-up difficulties if limiting diameters are actually employed, one would like to know whether this applies equally to exposed flames as to those entirely covered with a hotplate as described in the Gas Light and Coke Company's recent patent specification for its flame-proof burner.

(*c*) It was never implied in the Fellowship Reports that "dead-space" should be adopted as a criterion for gas quality in place of, say, the A.T.B. Number. It was implied that the measurement of the limiting diameter of any particular supply provides an index of its "light-back" tendency. Further, it was added clearly that there is no relationship between "light-back" and "blow-off," and that these two phenomena must be separately assessed with each particular supply. It may be added that, while the A.T.B. Number gives an indication of the conditions under which a burner will work well and provides a "control," what is also required is an indication of the circumstances under which a burner will fail, and how far the A.T.B. can define this is still open to question.

(*d*) Mr. Minchin is correct in his surmise that certain matter was missing from the Interim Report. Unfortunately this Report had gone to press before the omission was detected, and it was therefore arranged that a short Addendum be appended to any reproduction. The matter detached from our script indicated that the limiting diameter is not numerically actually equal to twice the "dead-space"; it is necessary to allow for the dimension of a gap surrounded by the "dead space" and requisite to accommodate the passage of flame. In the case of ethylene-air mixtures at 75 cm. pressure, if a constant of 1.5 mm. be allowed for the gap referred to, then in all cases the limiting diameter less 1.5 mm. gives a value very closely in agreement with twice the previously-measured "dead-space," as the following figures show, a 1 cm. burner being used. The interpretation of the phenomena related to this minimum flame size will be made the subject of further investigation.

Per cent. C_2H_4 in air.	Limiting diameter at 75 cm. pressure, mm.	Limiting diameter — 1.5, mm.	2 x "Dead space" (as actually measured).
5	2.26	0.76	0.66
6	1.93	0.43	0.40
7	1.78	0.28	0.30
7.5	1.78	0.28	0.30
8	1.93	0.43	0.40
9	2.26	0.76	0.80
10	2.70	1.20	1.54

It is for the reason stated that the calculations made by Mr. Densham, who estimated the appropriate dead spaces on the basis of their being exactly half the limiting diameters recorded in the Interim Report, found disagreement between ignition velocities for a number of combustible gases and the calculated feed velocities for "light-back" at the "dead-space" distance from the burner wall. This apart, we feel that the figures used by Mr. Densham were taken from so many different sources that they are hardly applicable to our own experiments.

Mr. Densham will be interested to know that we had not overlooked checking, by means of the Hagen-Poiseuille formula, our contention that "light-back" occurs when the ignition velocity exceeds the feed velocity at the "dead space" distance from the burner walls; Table A will make clear the close agreement between the calculated and actually measured figures. It was indeed this knowledge, coupled with all the experimental evidence published in the 1939–40 Report, which convinced us of the importance of "dead space" in relation to "light-back." In view of a number of variables which cannot be assessed, such as any deviation from true parabolic distribution, the thickness of the boundary layer, &c., closer agreement can hardly be expected.

TABLE A.—Comparison between Calculated and Measured "Dead Spaces" (1 cm. Burner).

Pressure, cm. Hg.	Per cent. C_2H_4 in air.	Flame-speed, cm. per sec.	Average rate of flow at "light-back," cm. per sec.	Calculated "dead-space," mm.	Measured "dead space," mm.
40	6	52.5	99	0.70	0.47
	7.5	60	143	0.56	0.42
	5	63.5	140	0.61	0.43
	8	58	127	0.61	0.47
	9	46	83	0.75	0.76
45	6	54.5	106	0.66	0.42
	7	59.5	152	0.50	0.35
	7.5	62	150	0.51	0.35
	8	57	136	0.52	0.42
	9	47.3	96	0.63	0.70
	10	(31.5)	32	1.37	1.07

It may be added, also, that while for all practical purposes in interpreting our results we accepted the Smith and Pickering view of "dead space" as the thermal gradient between the wall and the spontaneous ignition point of the mixture, we appreciate that further work on the subject may show other major determining factors to be involved.

Turbulence and "Blow-off."

We note Mr. Minchin's observation that a honeycomb grid of considerable depth is used to smooth out turbulence in wind tunnels, and for this reason it cannot be claimed that a grid would create turbulence. Our reply is that while such a grid would certainly smooth out existing turbulence, a narrow grid at a burner head would also create turbulence in a supply which would normally leave the burner with laminar flow.

In conclusion we wish to record another omission from the Interim Report in that no mention was made in it that the recent results of Fuidge, Murch, and Pleasance clearly indicate that "blow-off" becomes progressively more difficult as the aeration of any supply is diminished.

High Pressure Storage

In the course of a Paper to the Scottish Junior Gas Association (Eastern District) on the history and development of boosters and compressors Mr. L. Seaman, Technical Director of the Bryan Donkin Company, Ltd., mentioned that some of the problems of distribution under present conditions have been solved by the installation of the high pressure storage system. This system, he explained, was first introduced in America in 1925, and the first plant in this country was installed in 1928. In Switzerland there is a decided preference for this method of gas distribution and over 30 plants have been installed. In this country the compressors are practically all of the rotary multi-blade type direct coupled to electric motors. One feature of these installations is the charge for electric current. The compressors are only operated during the night, and in some cases the charge for current during the night is only about 25% of the minimum charge for current used in the daytime.

A high-pressure storage plant has recently been installed in the Midlands. This plant was installed on the outskirts of the town, where building developments had taken place very rapidly, and where the gas pressure fell below 3 in. W.G. during the mid-day load. The remedy was either to increase the size of the low-pressure district mains or to install a district gasholder, or put in a high-pressure storage plant. The first scheme was abandoned because of the cost, the holder was not installed because consent to its erection in a residential district would not have been obtained, and therefore the high-pressure storage scheme was adopted.

The compressor is of the two crank two cylinder (fig. 1), single acting type, having a capacity of 4,000 cu.ft. of free gas per hour when working against 60 lb. per sq. in. The compressor is driven through V belts by a totally enclosed induction type motor. The compressor is controlled by a Venner clock controller so that the plant can only run between the hours of 2 to 4 p.m. and between 11 p.m. and 5 a.m. A Bourdon gauge is fitted which starts and stops the plant during the

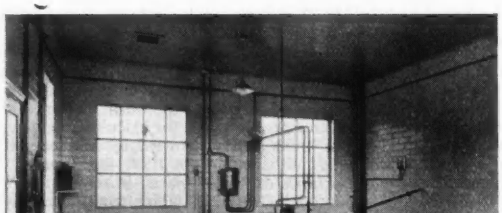

FIG. 1.

periods permitted by the clock. In order that the plant can start up against the load, a pilot valve is fitted in the pressure pipe to the unloading gear, and this pilot valve is held open by a solenoid until the compressor has reached full speed; then the compressor valves take up their normal duty. To prevent the compressor overdrawing the inlet main, a hydraulic regulator is fitted which operates a cut-out switch and this switch remains out until the inlet pressure is restored. There is also a tumbler switch which operates a thermostat in the compressor cooling water system, so that in case of a failure in the water supply and the temperature reaches a predetermined level, then the plant is automatically stopped. The pressure from the receiver is controlled by a governor of the Reynolds district type, and if this governor is open when the compressor is running, then the gas would simply circulate through the compressor and receiver and back into the inlet main, and therefore it is fitted with an automatic device so that immediately the compressor is started up the governor is automatically closed.

As regards labour costs, nobody is in regular attendance on this plant. A man lives nearby, and he calls every morning to examine the charts showing the pressure on the district and the pressure in the receivers; then once a week the clocks are wound and the oil level in the pressure sump is checked.

GAS AND ELECTRICAL DEVELOPMENT IN NEW ZEALAND

By A. S. FITZPATRICK, M.Sc., Ph.D.,
Chief Research Officer, National Gas Association of Australia

THE following is a summary of a Paper prepared at the invitation of the Gas Industry of New Zealand, which is seriously concerned with the recent refusal of the New Zealand Ministry of Housing to sanction the installation of gas appliances in State houses. It is an attempt to present the cogent arguments for the removal of the ban in the interests of democratic justice, of national economy and of individual householders.

The Paper presents the arguments against the ban imposed by the New Zealand Ministry of Housing on the installation of gas appliances in State-subsidized houses. The reasons why the ban should be revoked as soon as possible are:

1. Democratic Rights

In a democracy it is the right of the individual who pays the fuel bill to exercise his choice as to which fuel he buys. This right has been repeatedly sustained in English courts of law. The ban is an offence against personal liberty.

2. National Economy

(a) *Coal resources.*—Carbonization as practised by the Gas Industry provides the most efficient method of utilizing the Dominion's coal resources. This ensures the best use of the national assets of coal and is consistent with true conservation.

(b) *Increased value due to carbonization.*—From coal valued at £447,000 the New Zealand Gas Industry furnishes products in the form of gas, coke, tar, ammonia, &c., valued at over £1,500,000, an increase in value which contributes in no small degree to the wealth of the Dominion.

(c) *Products of the Gas Industry.*—The Gas Industry provides a variety of products, many of which are raw materials for other industries, and so either directly or indirectly it produces necessities which otherwise would have to be imported. In New Zealand, as in other countries, the Government is asking for benzole and toluole supplies —vital materials in wartime—while, on the other hand, through its ban, the New Zealand Government is striking at the heart of the Industry.

(d) *Capital costs in relation to energy output.*—For the production of the same amount of energy the hydro-electric industry borrows from the national wealth more than double the capital required by the Gas Industry. Though the provision of capital for an essential industry is not a problem in itself, the return on that capital must be provided out of the pockets of the consumers. Unless Government policy is directed towards co-operative development of gas and electricity, there will be destruction of wealth and heavier burdens on taxpayers generally. This will be wholly contrary to the interests of national economy.

(e) *Incidence of taxation.*—New Zealand gas undertakings annually contribute hundreds of thousands of pounds in rates and taxes to the Government and municipal coffers. Their competitors—the electrical undertakings—pay no rates and taxes. In effect, the taxpayers (including gas undertakings) bear that share of the rates and taxes which should be borne by the electrical industry. In view of this inequitable differentiation between gas and electricity in the matter of rates and taxes, there is even less justification for the restraint of trade exercised by the Government through its ban on the use of gas in State houses.

(f) *Load factors for gas and electricity.*—It has been shown that electrical undertakings are striving to obtain certain classes of business which, if obtained, would be detrimental to their daily load curves and would, in consequence, increase the average price of electricity to the community. It is an acknowledged fact that gas undertakings, by meeting awkward high peak loads, assist electrical undertakings to obtain far better load curves and so facilitate the sale of electricity to the public at lower average prices. The New Zealand electrical undertakings, if permitted to pursue all classes of business, profitable and otherwise, will do grave harm to the community.

(g) *Characteristics of gas and electrical tariffs.*—It is evident that in many parts of New Zealand electrical tariffs have not been fixed on the basis of costs of supply and desirable load factors, but primarily from a competitive standpoint, which is not beneficial to the country as a whole. The tariff policy of the electrical undertakings is designed to restrict the progress of the Gas Industry by offering inducements to householders at the expense of the commercial and industrial consumers. In the long run, the average electrical consumer or the community generally does not benefit by this uneconomic form of competition. The Government, instead of placing a ban on gas, should prevent such an abuse on the part of the electrical undertakings.

3. The Domestic Use of Gas and Electricity

Basis of selection of any fuel.—The householder when deciding which heat sources to use for a given purpose bases his decision on the following points: (*a*) Capital cost of the appliance; (*b*) fuel running cost; (*c*) maintenance cost; (*d*) life of the appliance; (*e*) how the appliance does the work; (*f*) appearance.

The New Zealand Ministry of Housing, in banning gas from State houses, has based its decision on one only of the six relevant factors —on that of running costs. Even if gas were dearer for running costs, many householders might very reasonably be prepared to pay these higher costs for the benefits gained in respect of one or more of the other factors.

Running costs for cooking.—Where use is made of the best electrical and gas cooking equipment, including the highly-efficient gas kettle, it has been shown in tests conducted in Melbourne that 1 therm of gas was equivalent to 26.5 units of electricity. On this basis, gas is cheaper than electricity for cooking in the majority of New Zealand towns.

Other factors.—Gas appliances have the advantage over electrical appliances with respect to capital cost, maintenance cost, life of the appliance, and how the appliance does its work. The popular desire for gas hotplates to be fitted on the top of electrical cookers is a sound indication of the truth.

Where householders are unrestrained by Government edicts, and where the supply authority states that it has fixed gas and electricity at equal costs for equal use, as in Perth (W.A.), gas cooker sales outnumber electric cooker sales in the ratio of 20 to 1, and eight times more water heaters than electrical are sold.

Other domestic uses for gas.—The ban prevents householders from using gas bath heaters, hot water systems, refrigerators, space heaters and wash coppers—all of which have certain advantages over their electrical competitors. Moreover, the ban denies householders any new use of gas which may be developed through scientific research.

Since, contrary to the opinions of the Ministry of Housing, gas is in fact, cheaper in certain towns than electricity for domestic purposes and irrespective of running cost, many householders prefer, on other grounds, to use gas, the repressive decision of the ban on gas should be revoked.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION

Presidential Address*

of

S. W. A. WIKNER, F.I.C.,

Newcastle

IN addition to selling smokeless heat upon an impressive scale the Gas Industry is a products industry selling tar and benzole, from which are obtained a variety of useful materials, some of which in time of war are of paramount importance.

Unlike most commodities the quantity of tar distilled has no relation to the demand for its products, but depends upon the production of gas or coke, the latter in its turn depending upon the market for steel. Again, one tar product may be in demand while another is not, yet both have to be made. In these circumstances a small variation is supply and demand may cause large and disconcerting fluctuation in the price of products, and there is little wonder that the business has been regarded as speculative to an extent which ill accords with the dignity of a utility company.

For many years large quantities of tar changed hands on the basis of the "GAS JOURNAL" price. This published price was understood to be based upon the yields from an average tar at the products prices of the moment, less an allowance for average working costs.

It was an attempt, admirable and in good faith, to assist the parties concerned in carrying on business and had a great vogue in this district. For a long time it served its purpose tolerably well, not always, however, without disappointment to one side or the other. Crude tars vary enormously in yield of products and so cannot fairly be valued by one price throughout the country. Thus the habit arose of offering a premium over "JOURNAL" price for certain tars, a practice which was also followed by distillers who wished to cut out a competitor.

One drawback was that forward contracts for sale of products could not be entered into without risk, as it frequently happened that brisk competition for the unsold balance sent up the price of the product, with a corresponding rise in the "JOURNAL" price for the whole of the tar. It might be thought that this would work both ways in the long run, but as often it did not, another element of speculation resulted.

In other parts of the country much experience has been gained in the working up of tar and disposal of products by co-operative effort in which the policy of trading is directed by a committee of producers and distillers. Reports indicate that these arrangements are working satisfactorily, and at least it should be possible to ensure that whatever element of speculation is inherent in the trade is equitably borne by both parties. Such a scheme has not up to the present found favour in this district, but from lessons now being learnt it is apparent that some form of co-operation must lead to the strengthening of the trade to the advantage of all concerned.

Among distillers there is a tendency, in spite of disappointing setbacks, towards co-operative marketing of products. It appears inevitable that in certain circumstances there will be different prices for the same product according to the use for which it is required, though perhaps the ethics of this may be open to argument. How else is it possible to deal with an excess of supply over demand? In order therefore to avoid a scramble by all for the higher priced market, pooling on the widest possible basis is necessary. It should be added that the foregoing remarks are intended to refer to a country at peace. Activities at the present time must remain under the fog of war, but if we retain something of the spirit of working unselfishly for the common good we may emerge the better equipped for organizing our Industry on a sounder basis.

Pitch constitutes more than one-half of the crude tar and its value therefore has a marked effect upon the finance of distillation. Before the present war production was in excess of requirements (principally for briquetting) and large stocks had accumulated. Certain markets have since been lost and other outlets must be sought.

It was known that up to say 3% of pitch could be mixed with the charge of coal to horizontal gas retorts, and my Company has treated some hundreds of tons of pitch in this way. From the point of yields, pitch was found to be worth not less than coal, but there was some extra cost of handling to ensure an even distribution in the coal. Occasionally trouble was caused by sticking of material about the doors of the hoppers. The project was abandoned mainly because it became possible to dispose of pitch at something more than the price of coal. A more promising outlet is as fuel, for which purpose pitch has certain advantages. It is almost free from ash, has a high calorific value (over 16,000 B.Th.U. per lb.), and can be melted for use in the liquid form either alone or thinned by addition of creosote oil. It can thus be used to replace imported oil fuel. A softer grade of pitch is being used for the manufacture of roofing felt in place of imported bitumen.

Creosote oil by reason of its aromatic character possesses unique properties, the value of which has probably not yet been fully exploited. For timber preservation it has no serious rival, but this use absorbs only a portion of the production. A considerable quantity is used in the hydrogenation process for the manufacture of motor spirit. Notwithstanding these major outlets there arise in normal times periodical accumulations of creosote and new uses must be sought. Some years ago much experimental work was done in several quarters on the use of creosote in internal combustion engines. The results of these experiments were summarized in a report submitted by the General Research Committee to The Institution of Gas Engineers in November, 1934, the Authors being E. W. Smith and H. M. Spiers. In spark ignition engines the results were rather discouraging and the project was dropped. One section in the report referred to the use of tar oils in compression ignition engines of the diesel type, the fuels mentioned ranging from neat tar oil down to a mixture containing 40% of tar oil. Recently the use of tar oils in diesel fuel has again attracted attention, and in Newcastle very good results have been obtained with a mixture of 75% petroleum diesel oil and 25% of washed light creosote. For the last twelve months some 45 buses have been running successfully on this mixed fuel. An increased mileage per gallon is obtained, as might be expected from the heavier weight of combustible matter in a gallon of creosote. Running has been practically trouble-free, although on a few occasions stoppages have occurred in the filtering system on the vehicles due to formation of sludge when the two oils are mixed. Reports from other districts indicate that this difficulty of sludge formation has been so serious as to lead to the abandoning of the use of tar oil. We find that by using freshly prepared tar oil with low content of tar acids very little sludge is formed.

In the experiments of 1934 too high a proportion of tar oil in the mixture was aimed at. Considering the large and growing consumption of diesel oil in this country the addition of 25% would absorb a large quantity of tar oil. When, seven years ago, the full tax was imposed on diesel oil for road use, hope was expressed that the creosote market might benefit exceedingly. That it has not done so is due in the main to our own inertia. There is an analogy in benzole for use in the spark ignition engine. Benzole cannot conveniently be used alone and must be mixed with petrol. The point here is that we had to do this ourselves, forming the National Benzole Company, Ltd., with all its equipment for mixing and marketing the product. Some similar scheme will be necessary if the use of blended tar oil and diesel oil is to be developed. By blending in bulk under supervision there should be no difficulty in overcoming the sludge trouble, either by settling or filtering.

Tar for road work provides an important outlet for our products, and its use is being regarded with increasing favour by surveyors, mainly as a result of close attention paid to quality and service.

In this district whinstone abounds, and while this hard stone is excellent for road making, careful treatment in coating is necessary, and special attention must be paid to the quality of the binder. For this reason it has been usual to specify the addition of some 10% to 20% of bitumen to the tar. In the present crisis imported bitumen is not readily available, and tar without bitumen is being used. An opportunity is thus given to confirm an opinion long held by us, that tar properly prepared need not be "laced" with bitumen in order to give good results.

It is satisfactory to record that conditions imposed by the war have not led to any falling off in the quality of road tar, nor has there been any marked increase in the price.

A great deal is being learnt about the extraction of benzole from coal gas and there is some hope of settling, perhaps finally, the question of whether it pays. This question from the gas-works point of view is one which involves a number of factors and is affected by local conditions. Being concerned only in the refining of the material my place in this controversy should perhaps be in the audience, but I may say that my Company has been well satisfied to extract benzole at some of its stations for many years. This is from horizontal gas.

The inhibitor process of refining introduced some years ago by the National Benzole Company has improved the financial return from benzole, particularly that from vertical retorts, where the losses in refining by the old acid wash process were generally prohibitive. At the present time the inhibitor process is proving to be very important indeed, not only adding to our fuel supply, but affording means for the production at reasonable cost of hydrocarbons even more vital to our war effort.

The prospect of a satisfactory post-war price for benzole appears to be bright. Extraction of benzole to the utmost limit would produce only a few per cent. of the motor spirit consumed in this country, which in 1938 was some 1,400 million gallons. Having this assured market the manufacture of benzole should give an increased value to our great national asset, coal.

It will be observed that all the products mentioned can be developed for use in place of imported material, and the present crisis gives a great opportunity to show what the trade can do in this way. All the lessons being learned under stern necessity will be valuable in the post-war period, when it is certain that an impoverished country must cut down its imports.

* Delivered May 1.

WORKS REPAIRS AND RECONSTRUCTION DURING WARTIME*

By F. LITLER, B.Sc.,

United Kingdom Gas Corporation, Ltd.

I THINK you might be interested to hear something of the origin, development, and work of an organization put into operation by a Holding Company, to assist its constituent companies to make their fullest contribution to the war effort by keeping pace with works repairs and undertaking whatever reconstruction became necessary. If this organization was to be of real value to the constituent companies, then it had to be capable of minimizing the effects of—

(*a*) A constantly decreasing supply of labour for the carrying out of minor repairs, normally undertaken by themselves.

(*b*) A decreased output of new plant, due to the Government utilizing some of the productive capacity of gas plant contractors for munitions, and also due to the limitations imposed upon these contractors by labour and material shortages.

(*c*) The inability of contractors, because of labour shortage, to cope with the increased demand for repair work.

(*d*) Damage to plant by attacks from the air.

Since most of our undertakings, prior to the war, had depended almost entirely upon outside sources for all major repairs and reconstructions, it was decided that the best assistance we could render to our companies was to put ourselves in such a position as to be able to undertake all the work that contractors would find themselves unable to tackle due to labour shortage. In other words, whatever resources the Holding Company could offer should be treated as a reserve, on which its constituents could fall back when they found themselves in trouble and unable to get things put right through pre-war channels.

At the time war broke out, most of our Yorkshire companies were to be supplied with coke-oven gas through the medium of the West Yorkshire Grid. Thus the United Kingdom Gas Corporation had an excellent reserve of carbonizing, washing, and purification plant to offer to its other companies, and so place them in a stronger position to carry out such repairs and extensions as their war effort demanded. Even so, it was no use having reserve plant if we could not guarantee that contractors would be available to dismantle and re-erect. Hence the organization set up for wartime assistance had not only to be capable of undertaking repair work, but also the reconstruction work that the contractors found themselves unable to carry out. Most of this surplus plant has now been re-used, and, as anticipated, most of its removal and re-erection has had to be undertaken by the Holding Company's direct labour.

Fortunately for the United Kingdom Gas Corporation and its constituent companies, there was in existence at the outbreak of war the nucleus of an organization that has since proved itself to be an extremely valuable asset for partially overcoming wartime difficulties. The origin of this organization goes back to 1938, when the Corporation decided to form two repair squads, one known as the Constructional Repair Squad, and the other the Carbonizing Repair Squad. It was intended that the work of the former should be confined to minor gasholder repairs, and the latter to the patching and re-setting of retorts at the works of our smaller companies.

In its early days the Constructional Repair Squad consisted of two men who travelled from company to company fixing handrailing, carrying out patching work, fixing new axles to carriages, and adjusting the latter to level the holder. Their equipment consisted of (*a*) a portable welding plant, (*b*) an oxy-acetylene cutter, and (*c*) a few hand tools.

Just prior to September, 1939, we were able to secure the services of a first-class gasholder erector, two additional welders, and a fitter capable of undertaking work in connexion with benzole plants, washers, purifiers, &c. In addition to hand tools, lifting tackle, &c., we purchased two additional welding plants and a set of special tackle for lifting a gasholder lift clear of the tank. War conditions rapidly proved that our investment had been sound. One of our constituent companies, making approximately 120 million per annum, had only one gasholder; this was a waterless holder of 500,000 cu.ft. capacity. On the works site were two other holders, one ready for demolition and the other awaiting repairs; the capacity of each of these holders was 100,000 cu.ft. The repair we had to undertake on one holder consisted of: (*a*) Cutting out the bottom three strakes of the tank plates, (*b*) completely re-sheeting the inner lift, (*c*) putting on new cup and dip skirting plates, and (*d*) extensive patching on the sides of the outer lift.

The work required on the other holder consisted of extensive patching and the renewal of the top round of the side sheeting on the inner and outer lifts. All the repairs were carried out by arc welding and both holders were in commission again by the beginning of March, 1940.

Our constituent companies have derived many advantages which during wartime are not available to independent undertakings. Our work of dismantling and re-erecting surplus plant has been greatly simplified on many occasions by the generous co-operation of the makers of the plant. In almost every instance they have let us have their detailed drawings and no one more than myself has appreciated the value of this assistance. I should like to make this an occasion for thanking all contractors who have co-operated with the Corporation and helped our work in this way.

The Author then gave details to illustrate the varied forms of assistance they had been able to give to their constituent companies, and he drew attention to the comparatively small amount of new material that has been used in the schemes.

The service to our companies has been limited due to the shortage of men; furthermore, we have not always been able to obtain all the tackle required and our squads have had to exercise a great deal of improvisation. Our senior foreman repeatedly asked me to get him a portable punching and shearing machine. I tried in vain for many weeks, and I was very reluctant to tell him that it was impossible to get one. He had been doing all the punching of holes he required with a bear punch. However, when I did tell him, he said, "Well, we'll have to make one of our own." A few weeks later I visited his job and he produced the home-made punching and shearing machine. Naturally, I asked where he had got the material from, and his reply was: "The frame's built up from scrap plate, joist and channel, the spur wheels are off the company's old charging machine, the flywheel's off an old exhauster, and the crankshaft's off an old pump; the punch and blades were made by the local blacksmith, and there she is." This improvised machine is 85% as efficient as the ready-made article. This same foreman has since made a set of portable rolls for putting a sweep in gasholder sheets, all from material picked up at various works.

Assistance after Air Attack

When our Repair Squads were being expanded to deal with a larger variety of work, we naturally arranged for the organization to be such that they could not only assist our companies to carry out ordinary everyday repairs, but also to carry out repairs brought about by air raid damage.

Each of our three gasholder squads, in addition to their tools and tackle, carry about with them, from job to job, what we call A.R.P. material. Briefly, this portable stores consists of: (*a*) A quantity of oxygen and acetylene, (*b*) welding electrodes, (*c*) Scott's cement and boiled oil, (*d*) "Denso" bandage, (*e*) gasholder patch bolts of our own design, (*f*) a miscellaneous selection of steel sheets, plates, angles, flats, joists, &c., (*g*) ready-made patches up to 3 ft. square, and (*h*) sundry sizes of bolts, nuts, and rivets.

Their tackle consists of a welding plant, a portable air compressor, together with pneumatic drills, riveting and caulking hammers, and, in addition, rope blocks, chain blocks, sling chains, hand tools, &c. Their supply of steel plate, &c., can readily be augmented from stocks, which we hold by permission of the Board of Trade, at various works of our companies. All our regular men are equipped with protective clothing, civilian duty gas masks, and respirators.

A.R.P. Organization in Motion

Most of our companies have motor lorries, and it is an understood thing that should a squad get an A.R.P. call when working at their works, then they undertake the haulage of the men and tackle to the damaged works. When working at a company that does not possess a lorry, then a similar arrangement is made with a local haulage contractor.

I should like to outline one or two repairs we have undertaken for companies having air raid damage. A 500-lb. bomb dropped at the gable end of a vertical retort house. At this end of the house was the hoist, the coal elevator, and two extractor engines. On reaching the works, we found the whole of the bottom of the hoist shaft and the concrete pit housing the elevator boot filled with debris. The extractor engines had been completely blown off their beds, and the extractors were having to be worked by hand. No coaling could be done either by the elevator or the hoist, which was primarily installed as a standby to the former. Fortunately the coal bunkers were reasonably full, and obviously the first thing to do was to improvise some form of coaling arrangement. A temporary platform at ground level was fixed across the shaft of the hoist and a petrol-driven winch was borrowed from a local engineering firm. Coal was taken up the hoist shaft in old oil drums, each drum holding 3 cwt. More coal was being carbonized than was being put into the bunkers, but we had four days to get the elevator working.

(*To be concluded*)

* From a Paper to the Manchester and District Junior Gas Association, March 11.

Gas Products Prices

The London Market May 11.

In addition to the Orders mentioned in our last report the following have been issued, both taking effect on May 1:

(1) The Control of Coal Tar Order, 1942—Statutory Rules and Orders, No. 732, 1942.

(2) The Naphthalene Prices (Inland) Order, 1942—Statutory Rules and Orders, No. 736, 1942.

Otherwise, there are no changes to report in the Prices of Coal Tar Products in the London Market.

The Provinces May 11.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 1s. to 1s. 4d. according to quality. Solvent naphtha, naked, North, 2s. to 2s. 3d. Heavy naphtha, North, 1s. 10d. to 1s. 11d. Carbolic acid, 60's, controlled by the Coal Tar Acids Prices (Inland) Order, 1942, operative from May 1. Naphthalene, controlled by the Naphthalene prices (Inland) Order, 1942, dated April 15, 1942, and operative from May 1, 1942, £19 to £19 10s.—bags free. Anthracene, controlled by the Anthracene Prices (Inland Order, 1942, operative from May 1. Filtered heavy oil (min. gr. 1,080), 7½d. to 8d.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland May 9.

Steady conditions continue. Refined tar, schedule prices unchanged. *Ex* works yield about 4½d. to 4¾d. per gallon, naked. Creosote oil: Specification oil, 6¼d. to 6½d.; low gravity, 7d. to 7½d.; neutral oil, 6½d. to 6¾d. per gallon; all *ex* Works in bulk. Cresylic acid: According to quality values are between 3s. 6d. and 5s. per gallon, *ex* Works, naked. Crude naphtha: 6½d. to 7d. Solvent naphtha: 90/160 grade 2s. to 2s. 3d. and 90/190 Heavy Naphtha 1s. 9d. to 2s. per gallon. Pyridines: 90/160 grade 13s. and 90/140 grade 15s. per gallon.

Gas Stocks and Shares

The volume of business in the Gas Market continued steady last week and prices, with few exceptions, closed unchanged. A demand for East Surrey "B" stock led to an improvement of 5 points, but Oriental stock made a further fall of 7 points to 90 which compares with 115½ on January 1 last. It will be noticed that in the Supplementary List a surprise drop of 10 points occurred in Mid-Southern "A," and since the last transaction in this stock was recorded only a few weeks ago at 66½, the cause of the present fall is somewhat obscure.

The following price changes were recorded during the week:

PROVINCIAL EXCHANGES

Derby	112—117	+14
Hartlepool	66—68	+5
Liverpool Ord.	105—107	+1
Sheffield	124—126	+1

OFFICIAL LIST

Alliance & Dublin	93—98	−1
East Surrey "B"	70—75	+5
Gas Light Units	12/—13/-	−/3d.
Ditto 3 p.c. Deb.	82½—85½	+½
Montevideo (*x.d.*)	68—73	May 4
Oriental	85—95	−7
Severn Valley Ord.	16/6—18/6	+/6d.
Ditto 4½ p.c. Pref.	16/6—18/6	+/6d.
Wandsworth 4 p.c. Deb.	85—90	+1

SUPPLEMENTARY LIST

Mid-Southern "A"	50—60	−10

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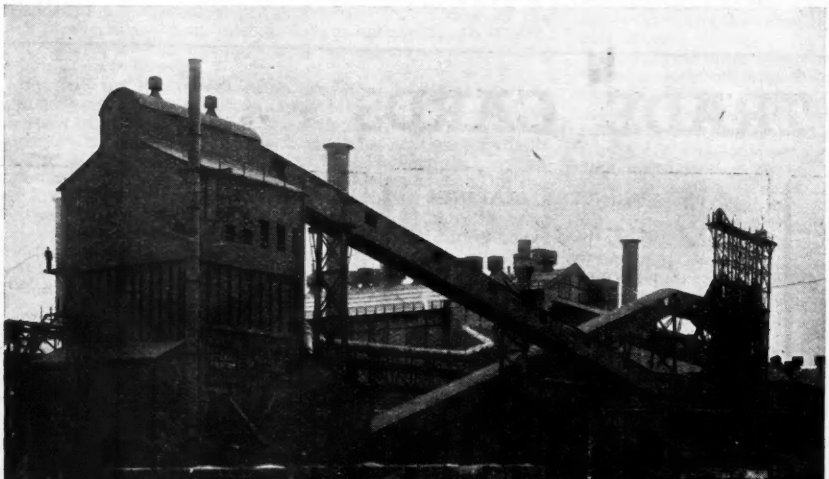

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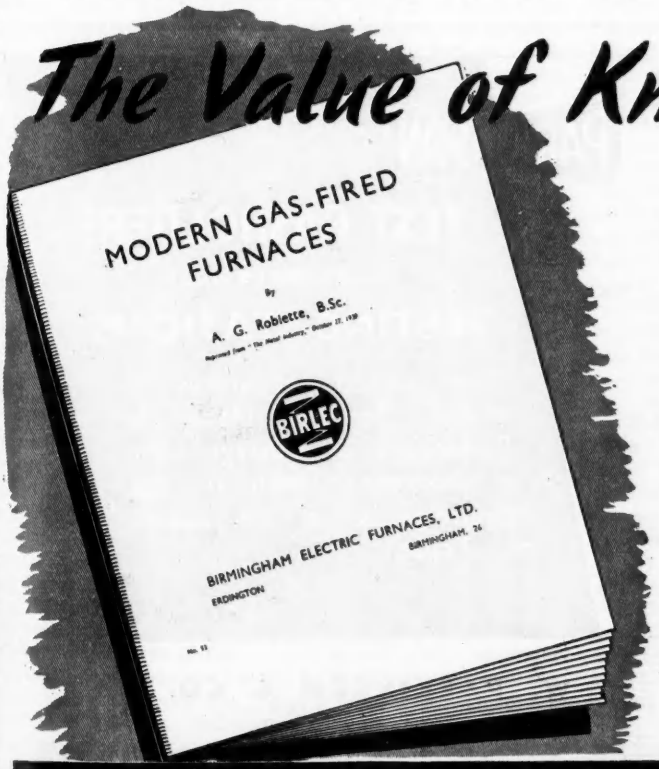

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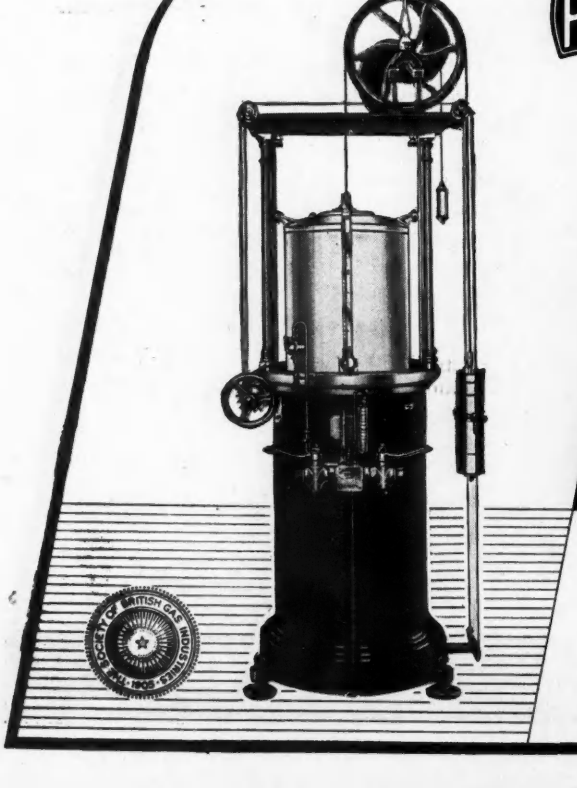

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